

# GNU/Linux on ARM

for \$50-\$100



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<http://blog.rot13.org>

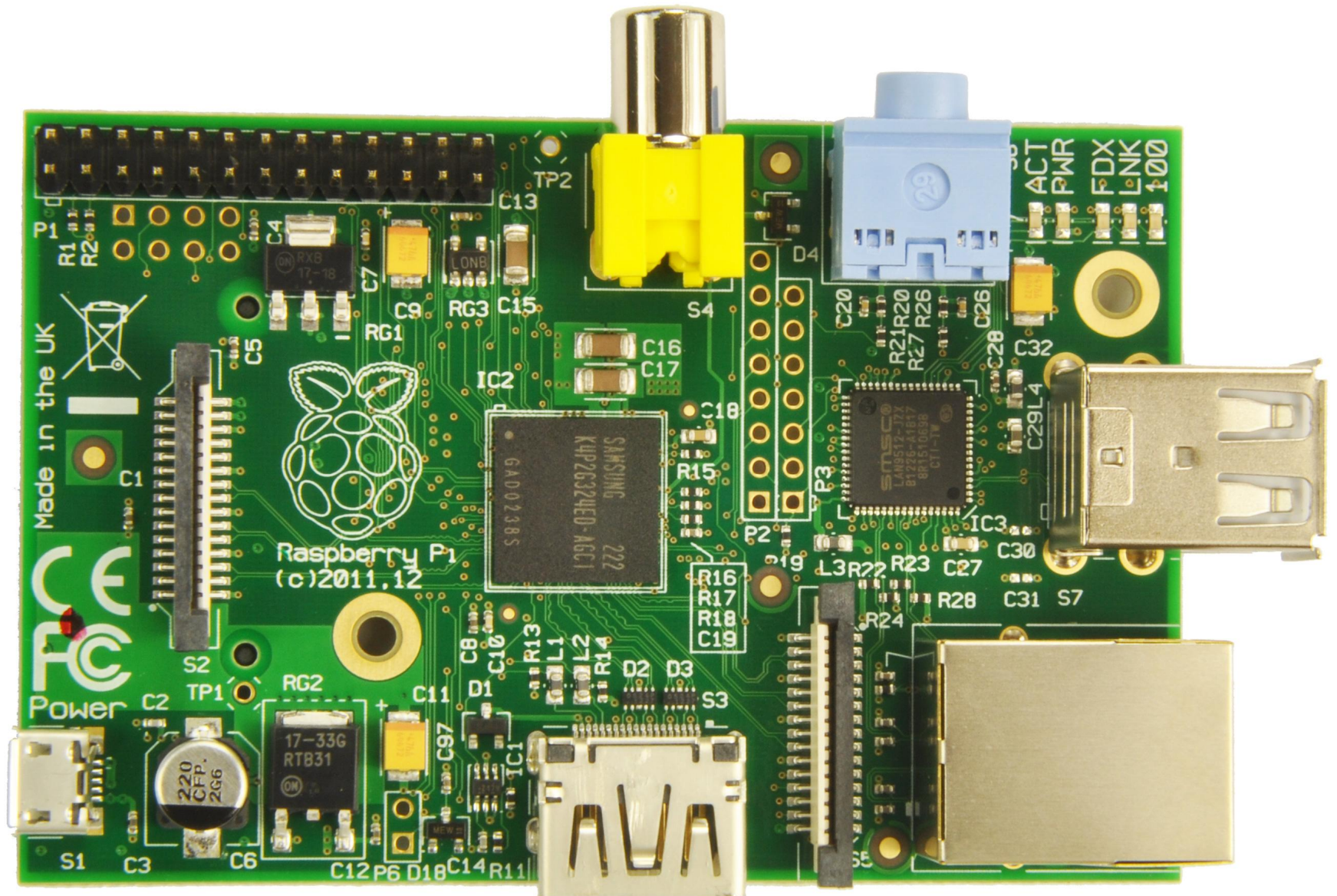
DORS/CLUC 2013

# What is goal of this presentation?

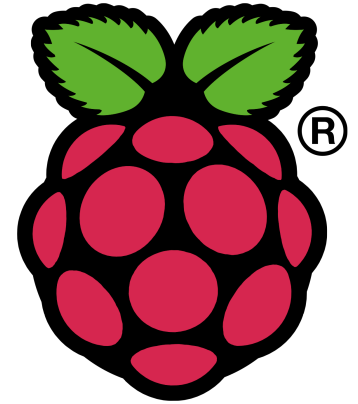
Explore capabilities of small ARM devices as GNU/Linux home servers without spending serious amount of cash - a year in review

- unbrickable - important for experiments
- GNU Linux distribution (apt-get, armhf)
- Explore connectivity options
  - USB, LAN, WIFI, bluetooth, SATA, IRDA, CEC
- What can we connect to it
  - UART, I2C, GPIO
- Focus on hackable devices with active community

# Raspberry Pi - BCM2835 - \$35



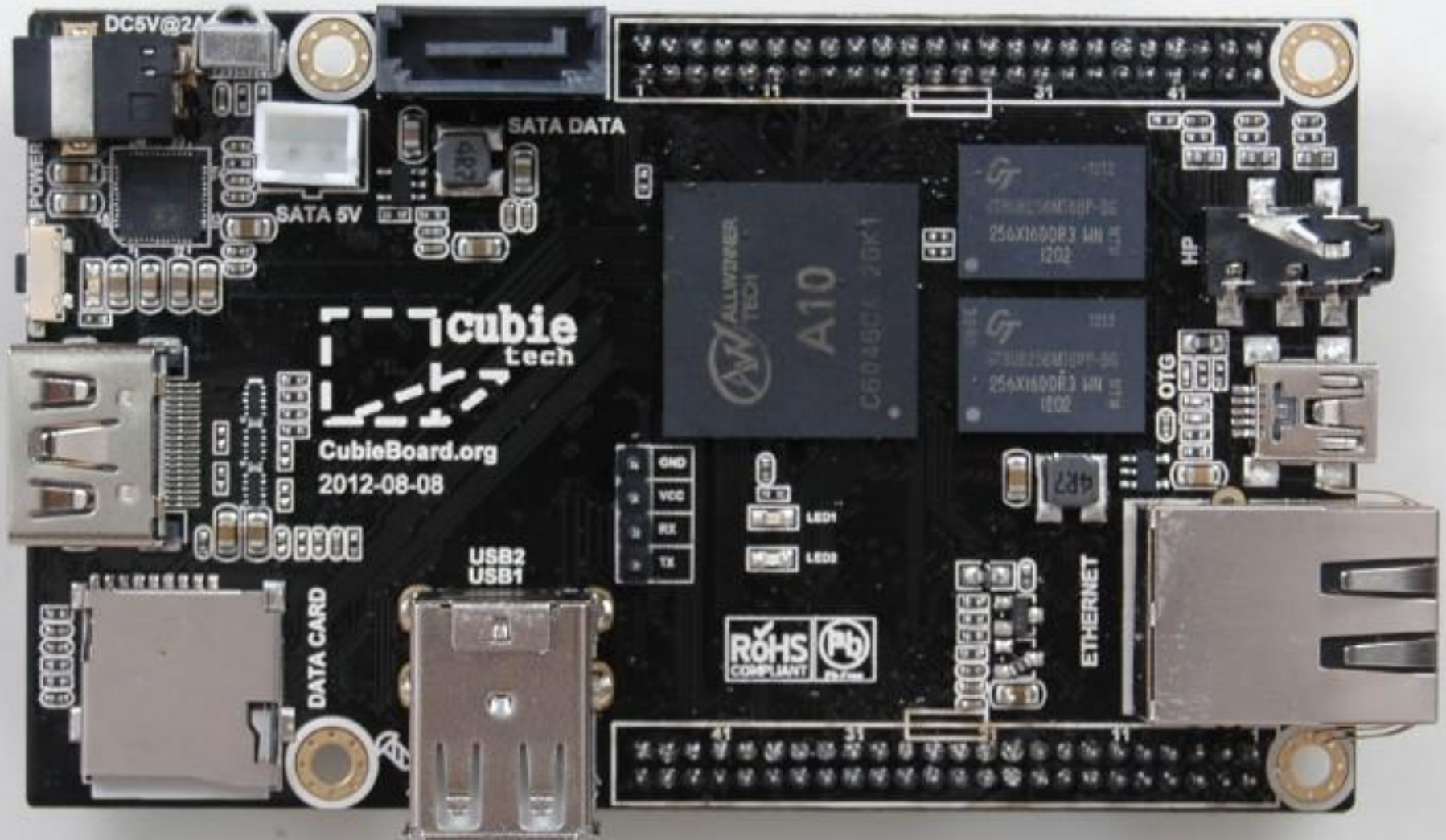
# Raspberry Pi - BCM2835 - \$35



- not for profit - great community
  - <http://www.raspberrypi.org/phpBB3/>
  - [http://elinux.org/RPi\\_Hub](http://elinux.org/RPi_Hub)
- hidden cost: SD, cables, power supply
- breakout board for BCM2835
  - Videocore IV is really DSP with ARM attached to it
  - <https://github.com/hermanhermitage/videocoreiv>
- bare-metal ARM - use as microcontroller
  - [http://elinux.org/RPi\\_Hardware](http://elinux.org/RPi_Hardware)
  - <https://github.com/dwelch67/raspberrypi> (JTAG...)
  - <https://github.com/sarfata/pi-blaster> (PWM)
- standard 2.54 mm pins, composite video



# Cubieboard - A10 1GHz - \$55

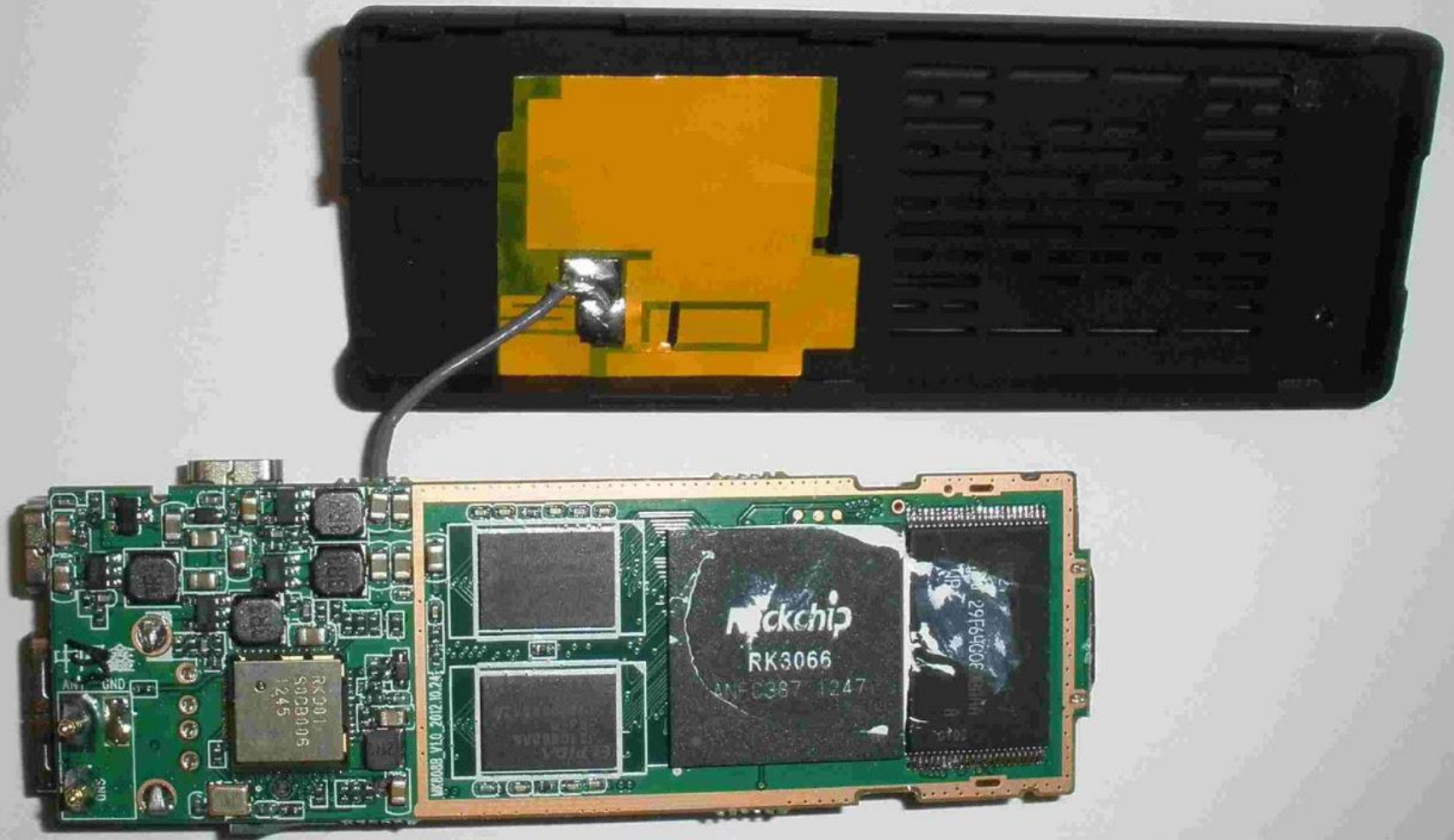


# Cubieboard - A10 1GHz - \$55



- unbrickable: A10 boots first from SD
- First available A10 board with SATA
- Active Linux SUNXI community
  - <http://linux-sunxi.org/Cubieboard>
- board schema available
- 2mm (metric!) pins for GPIO
- JTAG on uSD card slot
- Linux kernel 3.4.29
  - <http://romanrm.ru/en/a10/debian>
- Mali Open Source GPU code (runs Q3A)
  - <http://limadriver.org/>

# MK808 - RK3306 2\*1.2GHz - \$42



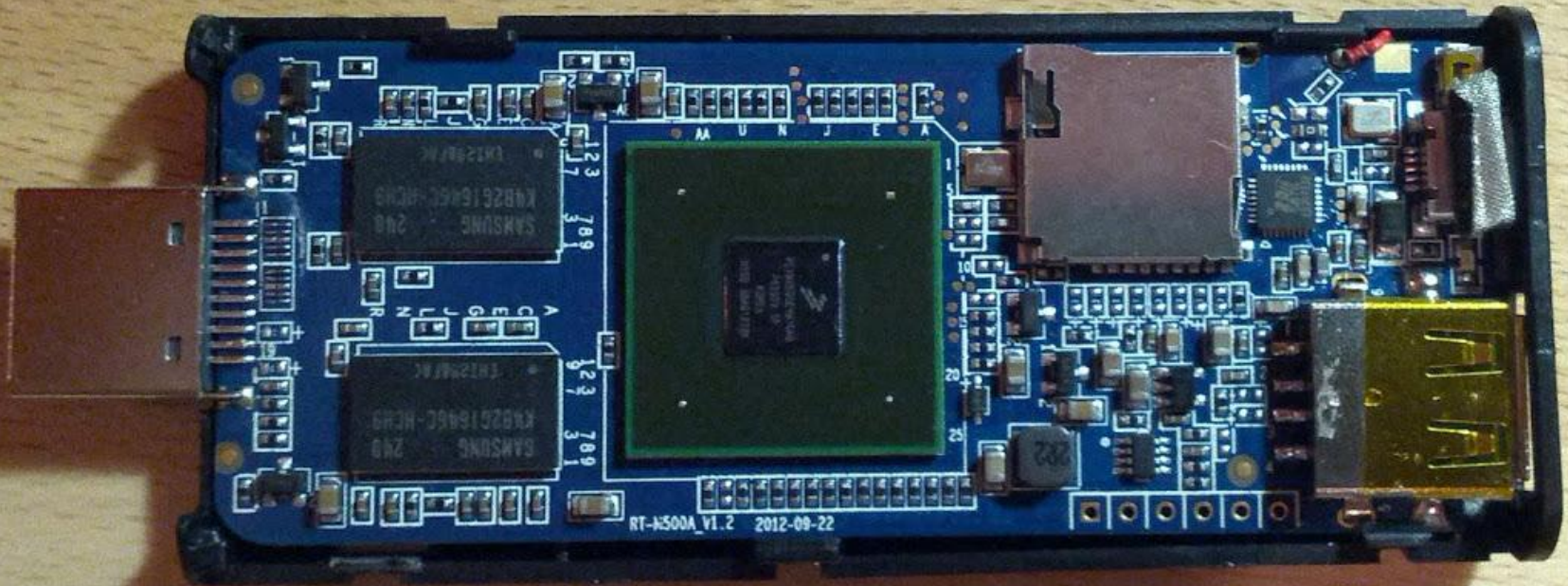
# MK808 - RK3306 2\*1.2GHz - \$42



- unbrickable - rkflashtool for flash peek/poke  
<https://github.com/dpavlin/android-command-line/blob/master/rockchip-flash-helper.pl>
- UG802 better hw or MK808B with bluetooth
- TTL serial console only (with soldering)
- Linux kernel 3.0.8  
<http://www.cnx-software.com/2012/11/04/rockchip-rk3066-rk30xx-processor-documentation-source-code-and-tools/>
- A lot of updates, including Android 4.2.2
- Ubuntu 11.10  
<http://www.cnx-software.com/2013/03/25/ubuntu-11-10-image-for-hi802-gk802-is-now-available-for-download/>
- Newer quad-core Rockchip cores have PowerVR and not Mali!



# GK802 - i.MX6 4\*1.2Ghz - \$90



# GK802 - i.MX6 4\*1.2Ghz - \$90



- unbrickable - two uSD cards (one internal)
  - [https://github.com/boundarydevices/imx\\_usb\\_loader](https://github.com/boundarydevices/imx_usb_loader)
- TTL serial, I2C pins
- great community
  - <https://github.com/imx6-dongle/wiki/wiki>
- Ubuntu 12.04 image (GPU with blob)  
<http://www.cnx-software.com/2013/04/05/preliminary-ubuntu-12-04-rootfs-for-gk802hi802-mini-pc/>
- Freescale HDMI Dongle reference design
  - <https://community.freescale.com/docs/DOC-93821>
- GPU open source work-in-progress
  - [https://github.com/laanwj/etna\\_viv/wiki](https://github.com/laanwj/etna_viv/wiki)

	<b>Raspberry Pi B</b>	<b>Cubieboard</b>	<b>MK808</b>	<b>GK802</b>
<i>price</i>	\$35	\$55	\$42	\$90
<i>SOC</i>	BCM2835	A10	RK3306	i.MX6
<i>core type</i>	ARM11	Cortex A8	Cortex A9	Cortex A9
<i>nr. of cores</i>	1	1	2	4
<i>CPU clock</i>	700 Mhz - 1 GHz	1 GHz	1.2 GHz	1.2 GHz
<i>GPU</i>	VideoCore IV	Mali 400	Mali 400MP4	Vivante GC2000
<i>RAM</i>	512 MB @ 400 MHz	1 Gb @ 480 Mhz	1 Gb DDR3	1 Gb DDR3
<i>built-in NAND</i>	-	4 Gb	8 Gb	no, 8 Gb uSD
<i>USB</i>	2	2 + OTG	1 + OTG	1 + OTG
<i>storage</i>	SD	uSD, SATA	uSD	2 * uSD
<i>Ethernet</i>	100 Mbit/s (on USB)	100 Mbit/s	-	-
<i>Audio</i>	out	line in/out	-	-
<i>Wifi</i>	-	-	802.11bgn	802.11bgn
<i>Bluetooth</i>	-	-	model MK808B	yes
<i>pins</i>	12 GPIO, UART, SPI, I2C, CSI, DSI	2 * 48 pin I2C SPI RGB LVDS CSI FM-IN ADC VGA SPDIF-OUT R-TP	UART	UART, I2C
<i>power</i>	5V 700mA micro B	5V 2A 4mm	5V 2A	5V 2A

# UDOO - i.MX6 + Arduino - \$109/\$129



<http://www.kickstarter.com/projects/435742530/udoo-android-linux-arduino-in-a-tiny-single-board>

Honorable mention only, SATA needs quad-core i.MX6!





# No Android left behind!

- BotBrew Basil EXPERIMENTAL
  - emdebian in chroot (requires root)
  - <https://play.google.com/store/apps/details?id=com.botbrew.basil>
- stop Android stack and use X11
  - <http://blog.rot13.org/2012/08/x11-running-on-nook-color-without-android-stack.html>
- libhybris - bionic HW drivers with glibc
  - <https://github.com/libhybris/libhybris>
  - Mer on cubieboard <http://martinbrook.blogspot.co.uk/2013/04/adventures-with-libhybris-and-andriod.html>

	Sample 1: Original irregular Kingston card from authorized Kingston distro	Sample 2: Normal Kingston card from authorized Kingston distro	Sample 3: US retail Kingston card	Sample 4: Fake card bought from SZ market	Sample 5: Questionably authentic Kingston card bought from SZ market	Sample 6: SanDisk card bought from SZ market	Sample 7: Samsung card bought from authorized Samsung distro
Front marking							Image missing
Back marking							Image missing
Decapsulated							
Controller die marking							
FLASH die marking		(Sandisk/Toshiba FLASH)		(Sandisk/Toshiba FLASH)		(Sandisk/Toshiba FLASH)	

<http://www.bunniestudios.com/blog/?p=918>

<https://wiki.linaro.org/WorkingGroups/KernelArchived/Projects/FlashCardSurvey>



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